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Assessing Rangelands

Abstract

It is important for land managers and technical assistance specialists to be able to assess the health of rangelands in order to know where to focus management efforts. The complexity of ecological processes, and the inherent expense of directly measuring site integrity, suggests a need for an evaluation process that focuses instead on biological and physical attributes. In a collaborative effort, the USGS, ARS, BLM, and NRCS have jointly developed a system in which 17 indicators are used to gauge three attributes of rangeland health. A qualitative, observational procedure provides an assessment of the functional status of these indicators. This quick assessment technique, by providing an understanding about each attribute, helps interpret rangeland health.

Overview

Rangelands are natural ecosystems where the native vegetation consists predominantly of grasses, grass-like plants, forbs, or shrubs. Rangelands include natural grasslands, savannas, shrublands, oak and pinyon-juniper woodlands, many deserts, tundra, alpine communities, marshes, and wet meadows.

It is important for land managers and technical assistance specialists to be able to assess the health of rangelands in order to know where to focus management efforts. Rangeland health is "the degree to which the integrity of the soil, vegetation, water, and air, as well as the ecological processes of the rangeland ecosystem, are balanced and sustained." Integrity in this context means the "maintenance of the functional attributes characteristic of a locale, including normal variability."

Ecological processes functioning within a normal range of variation support a diverse mixture of plant and animal communities. These ecological processes include:
the water cycle—the capture, storage, and redistribution of precipitation;
energy flow—conversion of sunlight to plant and animal matter; and
nutrient cycles—the cycle of nutrients such as nitrogen and phosphorus through the physical and biotic components of the environment.

Due to the complexity of ecological processes and their interrelationships, it is usually difficult or expensive to directly measure site integrity and the status of ecological processes. Therefore, biological and physical attributes are often used to indicate the functional status of ecological processes and site integrity.

The U.S. Geological Survey (USGS), Agricultural Research Service (ARS), Bureau of Land Management (BLM), and Natural Resources Conservation Service (NRCS) developed a technique to assess rangeland health. Because rangelands are complex ecosystems, it is difficult to attain a single rating of rangeland health. This technique assesses separately three attributes of rangeland health (see box).

Indicators are components of a system whose characteristics (e.g., presence or absence, quantity, distribution) are used as an index of an attribute that is too difficult, inconvenient, or expensive to measure. Several indicators must be used to gain an understanding about each attribute of rangeland health. By using a qualitative, observational procedure, the functional status of such indicators can be assessed.

This fast assessment technique includes both plant and soil indicators that can help educate the public, private landowners, and agency personnel about interpreting and assessing rangeland health. In the past, indicators used in rangeland monitoring and resource inventories by land managers and technical assistance agencies have focused on vegetation (e.g., production, composition, density) or soil stability and were used to indicate rangeland condition or livestock carrying capacity. Such single indicator assessments are inadequate to determine rangeland health because they do not reflect nor assess the complexity of ecological processes. Rather than a single indicator, a suite of key indicators should be used for an assessment. In this system, 17 indicators are used to gauge the three rangeland health attributes: soil/site stability, hydrologic function, and the integrity of the biotic community of selected rangeland ecological sites.

Rangeland Health Attributes

Soil/site stability—the capacity of the site to limit redistribution and loss of soil resources (including nutrients and organic matter) by wind and water.

Hydrologic function—the capacity of the site to capture, store, and safely release water from rainfall, run-on, and snowmelt (where relevant), to resist a reduction in this capacity, and to recover this capacity following degradation.

Integrity of the biotic community—the capacity of the site to support characteristic functional and structural communities in the context of normal variability, to resist loss of this function and structure due to disturbance, and to recover following disturbance.

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Evaluation Process

Step 1 — Identify the evaluation area. Verify soil and ecological site identification.

Step 2 — Obtain, if it exists, or develop a Reference Worksheet using the ecological site description, data, and knowledgable experts. Then visit several reference areas to observe the indicators on these sites.

Step 3 — Obtain, if it exists, or develop the Indicator Evaluation Matrix for the ecological site.

Step 4 — Return to the evaluation area and complete the Site Characterization Worksheets.

Step 5 — Rate the 17 indicators on the evaluation area.

Step 6 — Determine the functional status of the three rangeland health attributes.

Examples of Indicators

Pictures on the left visually represent the expected conditions at the site, whereas the pictures on the right show conditions that deviate from what is expected.

Soil Stability

Amount of bare ground is slightly less than expected given the site potential and recent weather.

Amount of bare ground is excessive relative to site potential and recent weather.

Hydrologic Function

Desert grassland site where grasses promote infiltration and minimize runoff.

Degraded desert grassland site where runoff has dramatically increased due to conversion from grass to shrubs.

Integrity of Biotic Community

Sagebrush-perennial bunchgrass site near potential. Native annual grasses are a minor component of the vegetative mix.

Perennial bunchgrasses have been replaced with cheatgrass, an exotic annual grass. Accelerated erosion is also evident.

What the collaboration team is doing:

- publishing manuscript — Pyke, D.A., J.E. Herrick, P. Shaver, and M. Pellant. 2002. Rangeland health attributes and indicators for qualititative management. Journal of Range Management 55(6)
- working to develop quantitative protocols
- teaching a training course about how to use the assessment techniques through the BLM National Training Center
- investigating the potential of using these assessments as part of a national assessment such as the Natural Resources Conservation Service National Resources Inventory

Intended Applications

Qualitative assessments of rangeland health, in association with quantitative monitoring and inventory information, provide early warnings to land managers of resource problems on upland rangelands. Qualitative assessments are intended to provide a preliminary evaluation of soil/site stability, hydrologic function, and integrity of the biotic community (at the ecological site level). They can also help land managers identify areas that are potentially at risk of degradation and be used as a communication tool to help explain fundamental ecological concepts to a wide variety of audiences in the field. We strongly encourage land managers to initiate quantitative monitoring techniques when rangeland health attributes are rated at or below moderate deviation from that expected for the site. These monitoring procedures should focus on the attributes and indicators of concern. Such assessments are used to identify resource problems; however, the technique was not designed to identify the causes of these problems. Management decisions, therefore, should not be made solely from results of these assessments. This procedure has been developed for use by experienced, knowledgeable land managers only.

Reference

Pellant, M., P. Shaver, D.A. Pyke, and J.E. Herrick. 2000. Interpreting indicators of rangeland health, version 3. Interagency Technical Reference 1734-6, USDI, Bureau of Land Management, National Science and Technology Center, Denver, CO.

To obtain a copy of the technical reference, send an e-mail request to: fresc_outreach@usgs.gov.

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